

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants : Anna KRON et al.
Serial No. : 10/758,540
Filed : January 16, 2004
For : MICROSPHERES
Examiner : Irina Sopjia Zemel
Art Unit : 1796

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office via the Office electronic filing system on

Date: January 26, 2009

Signature: /Julie Forero/

TRANSMITTAL OF APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

S I R:

Transmitted herewith for filing in the above-identified patent application is an Appeal Brief Pursuant to 37 C.F.R. § 41.37.

The 37 C.F.R. 41.20(b)(2) Appeal Brief fee of \$ **540.00** is being paid by credit card.

The Commissioner is authorized to charge any additional fees or credit any overpayment in connection with this paper to Deposit Account No. 11-0600.

Respectfully submitted,

Dated: January 26, 2009

By: /Willem F. C. de Weerd/
Willem F. C. de Weerd (Reg. No. 51,613)

KENYON & KENYON LLP
One Broadway
New York, New York 10004
(212) 425-7200
CUSTOMER NO. 26646

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants : Anna KRON et al.
 Serial No. : 10/758,540
 Filed : January 16, 2004
 For : MICROSPHERES
 Examiner : Irina Sopjia Zemel
 Art Unit : 1796

Mail Stop Appeal Brief-Patents
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450

I hereby certify that this correspondence is being electronically transmitted to the United States Patent and Trademark Office via the Office electronic filing system on

Date: January 26, 2009

Signature: /Julie Forero/

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

On November 21, 2008, Appellants submitted a Notice of Appeal from the last decision of the Examiner contained in the Final Office Action, dated August 21, 2008, in the above-identified application. The Notice of Appeal is believed to have been received by the United States Patent and Trademark Office on November 24, 2008. Accordingly, the filing of this Appeal Brief on January 26, 2009 is timely, (January 24, 2009 being a Saturday).

In accordance with 37 C.F.R. § 41.37, this Appeal Brief is submitted in support of the appeal of the final rejections of claims 1-23. For the reasons set forth below, the final rejections of claims 1-23 should be reversed.

1. REAL PARTY IN INTEREST

The real party in interest in this appeal is AKZO NOBEL N.V., the Assignee of the entire right, title, and interest in and to the present invention.

2. RELATED APPEALS AND INTERFERENCES

There are no other prior or pending appeals, interferences, or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the

Assignee, AKZO NOBEL N.V., “which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.”

3. STATUS OF CLAIMS

Claims 1-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 4,287,308 (“Nakayama et al.”) in combination with US Patent 4,255,307 (“Miller”). All of the pending claims 1-23 are being appealed.

4. STATUS OF THE AMENDMENTS

No amendment has been submitted subsequent to the Final Office Action of August 21, 2008. The claims, as included in the annexed “Claims Index,” reflect the rejected claims as currently pending, the rejections for which are hereby appealed.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to a process for the production of expandable thermoplastic microspheres, a process for eliminating or reducing residual monomers from expandable thermoplastic microspheres, and microspheres obtainable by this process. More specifically, the invention deals with the problem of providing an efficient **method of eliminating or reducing residual monomers without unacceptable discoloration of the microspheres or significantly adversely affecting their capability of expansion**. It has been found possible to solve this problem by contacting said microspheres with an agent selected from the group consisting of **oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms**. The processes of the present invention thereby remove residual monomers from expandable thermoplastic microspheres without causing significant discoloration problems, providing expandable thermoplastic microspheres with both **high brightness and low residual monomer content**, without negatively affecting important properties of the microspheres, such as expandability.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-23, which stand rejected under 35 U.S.C. § 103(a), are patentable as non-obvious over Nakayama et al. (4,287,308) in view of Miller (4,255,307).

7. ARGUMENT

a. Rejection of Claims 1-23 under 35 U.S.C. § 103(a)

Claims 1-23 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the combination of US Patent 4,287,308 (“Nakayama et al.”) in view of US Patent 4,255,307 (“Miller”). Appellants respectfully submit that the combination of Nakayama et al. and Miller does not render the present claims unpatentable. The Final Office Action maintains that the combination of Nakayama et al. with Miller clearly suggests reducing the amount of residual monomer (acrylonitrile) in the polymeric shell of an expandable thermoplastic microsphere as in the claimed invention using sulfites as sulfur-containing agents. Further, this obviousness rejection is improper for failing to provide a showing of *prima facie* obviousness.

b. Requirements for a Prima Facie Case of Obviousness

In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q. 2d 1955, 1956 (Fed. Cir. 1993) (Citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)). Only if that burden is met, does the burden of coming forward with evidence or argument shift to the applicant. *Id.* If the examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. *Id.*, (Citing *In re Fine*, 37 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988)). To establish a *prima facie* case of obviousness, at least three criteria must be satisfied, as set forth in M.P.E.P. § 2143. First, there must be a reason to combine and/or modify the teachings of the cited prior art references. *KSR International Co. v. Teleflex Inc.*, 550 U.S. ____ (2007), 2007 WL 1237837 at 12; *see also In re Fine*, 37 F.2d at 1074; *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992). Second, there must be a reasonable expectation of success without resort to hindsight. *In re Merck & Co.*, 800 F.2d 1091, 1097, 231 U.S.P.Q. 375 (Fed. Cir. 1986); *In re Dow Chemical Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988). Third, the prior art references, when combined, must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 985 (C.C.P.A. 1974). In addition, the Court of Appeals for the Federal Circuit has found that a proposed modification to the teaching of a reference is inappropriate for an obviousness inquiry when the modification would render the prior art reference inoperable for its intended purpose. *In re Fritch*, at 1266 n.12 (Citing *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed.Cir. 1984)); M.P.E.P. § 2143.01(V).

In a recent decision, the United States Supreme Court reiterated the standard for a holding of obviousness, as set forth in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 86 S.Ct. 684. The Court held

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.” *KSR International Co. v. Teleflex Inc.*, 550 U.S. ____ (2007), 2007 WL 1237837 at 6 (citing *Graham*, 383, U.S. 17-18, 86 S.Ct. 684).

The court further stated “*Graham* set forth a broad inquiry and invited courts, where appropriate, to look at any secondary considerations that would prove instructive.” *Id.* at 12. However, “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *Id.* To be unobvious, an “improvement [must be] more than the predictable use of prior art elements according to their established functions. *Id.* at 13. The fact that the elements of an invention work together “in an unexpected and fruitful manner” supports the conclusion that an invention is not obvious to one of ordinary skill in the art. *Id.* at 12.

Thus, in order for a claim to be rejected for obviousness under 35 U.S.C. § 103(a), the prior art must teach or suggest each element of the claim. To establish a *prima facie* case of obviousness, the Examiner must show, *inter alia*, that there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the references and that, when so modified or combined, the prior art teaches or suggests all of the claim limitations. See M.P.E.P. § 2143. Appellants respectfully submit that a *prima facie* case of obviousness has not been established by Nakayama et al. in view of Miller in regard to the currently pending claims.

c. The Final Office Action Does Not Present a *Prima Facie* Case of Obviousness

Appellants submit that, for the reasons set forth below, the Final Office Action does not present a *prima facie* case for obviousness. The cited references, whether taken alone or in combination, fail to disclose or suggest all of the claim limitations of claims 1-23. None of the cited references disclose or suggest to a skilled artisan, reducing the amount of residual acrylonitrile monomers in the polymeric shell of an expandable thermoplastic microsphere

using oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms, including sulfites as sulfur-containing agents, **while retaining its expandability and color**. Therefore, even if the cited references are combined, the resulting combination would not disclose or suggest the presently claimed invention. The claimed invention is more than a predictable use of prior art elements according to their established functions. *See KSR, supra*. Thus, the Final Office Action does not set forth a *prima facie* case for obviousness. Accordingly, Appellants respectfully submit that the rejection of the claims under 35 U.S.C. § 103(a) over Nakayama et al. in view of Miller is improper, and should be overturned. *See In re Rijckaert, supra*.

d. The Rejection Over Nakayama et al. In View of Miller

In the rejection under 35 U.S.C. § 103(a) over Nakayama et al. in view of Miller, the Final Office Action attempts to combine the disclosures of those references to set forth a *prima facie* case for obviousness. The Examiner agrees that the Miller reference does **not** use the claimed agent to reduce residual amounts of monomer in microspheres, that the physical properties and characteristics of aqueous dispersions of polymers and expandable microspheres are **different**, and that the sulfur-containing agents of Nakayama et al. do **not** perform optimally as compared with other agents. However, the Examiner alleges that none of these facts makes the rejection of the instant claim over the combined teaching of the two cited references any less obvious. *Final Office Action*, Page 3.

The Final Office Action states that although Miller discloses using the claimed agents in **aqueous solutions**, whose physical properties are different from the properties of microspheres, Miller uses the claimed agents for the same purpose as Nakayama et al., i.e., reducing residual amounts of monomer. Further, the Examiner contends that such reduction is a chemical process involving an identical chemical reaction, whether the polymer is in suspension or in the form of a microsphere. A given chemical compound is expected to react in the same chemical manner with another compound (in the instant case, identical residual monomer) whether the monomer is dispersed along with the polymer (which is non-reactive to the reducing agent) in aqueous suspension or the polymer microspheres are dispersed in aqueous suspension—in either case, unreacted residual monomer becomes available for reaction with reducing agents, and the reaction is chemically identical. *Id.*, Page 3.

The Examiner further argues that the differences in physical characteristics that may exist between Miller's aqueous dispersions of polymers and Nakayama et al.'s expandable microspheres do **not** play a role in the nature of the underlying chemical reaction. Therefore,

the Examiner argues that a skilled artisan would expect a successful outcome in reacting the reducing agents of Miller in the process of Nakayama et al. since an identical chemical reaction is expected between identical chemical compounds involved in this reaction. Further, the Examiner maintains that the Miller reference does not have to recognize specific advantages that the agents of his disclosure will bring about when used in the process of Nakayama; only **reasonable expectation of success** in using those agents is required. In addition, the Examiner states that she provided explicit motivation as to why the use of such agents is expected to be used successfully and also expected to provide some advantages. Motivation to combine references does not have to be the same as the motivation provided or recognized by Appellants. *Id.*, Pages 3 and 4.

In the Final Office Action, the Examiner notes that Appellants state that certain agents compromise the expansion and color characteristics of the resulting microspheres. She further states that the sulfur-containing agent of Nakayama et al., sodium sulfide, does not, according to the Appellants' disclosure, compromise the expansion characteristics, while the color characteristics are clearly expected from the characteristics of the sodium sulfide itself. In the absence of showing clearly unexpected results, recognition of any specific advantages of otherwise obvious process steps bears no weight on the patentability of the claimed process. The Examiner maintains that there is no evidence on record that substitution of expressly disclosed sodium sulfide in the process of Nakayama et al. with reducing agents disclosed by Miller results in any **unexpected advantage**. *Id.*, Page 4.

The Examiner submits that analyses supporting obviousness need not seek out precise teachings directed to the specific subject matter of the challenged claim, but should identify a reason why a skilled artisan would combine the elements in the manner claimed. *See KSR, supra*. Following the discussion set forth above, the Final Office Action asserts

Use of a known reducing agent (disclosed by Miller) for its precise known function in a chemical reaction with a monomer (process of Nakayama), which reaction is identical whether or not the polymer is dispersed in a specified media, would have been clearly obvious with reasonable expectation of success. In addition, use of such agent is expected to bring certain advantages, and there is absolutely nothing on the record that shows any unexpected results that can be attributed to use of a specific agent (disclosed in Miller) in the process of Nakayama. *Id.*, Pages 4 and 5.

e. Claims 1-23 Directed to a Process for the Production of Expandable Thermoplastic Microspheres, A Process for Eliminating or Reducing Residual Monomers from Expandable Thermoplastic Microspheres, and Microspheres Obtainable by This Process Are Non-Obvious Because There Is No Motivation to Combine Nakayama et al. with Miller

Contrary to the Final Office Action, Appellants disagree that it would be obvious to use agents disclosed by Miller in a process disclosed by Nakayama et al. as functional equivalents. Although Nakayama et al. disclose several agents for eliminating acrylonitrile monomers from expandable microspheres, there is no teaching regarding other effects by using such agents, such as **discoloration or reduction of the expansion capabilities** of the microspheres. According to the present invention, it has been found that all agents for reducing or eliminating acrylonitrile monomers are in fact not functionally equivalent in the treatment of expandable microspheres. This is shown in Example 1 of the present invention where sodium sulfide, one of the particularly preferred agents disclosed by Nakayama et al. (*see Nakayama et al.*, col. 3, lines 38-40), gives severe discoloration of the microspheres (and bad smell), while other agents such as benzene sulfonic amide or diphenyl sulfoxide affect the expansion capacity of the microspheres. On the other hand, the agents according to the present invention give **both** effective removal of residual monomers and no or insignificant discoloration, which is clearly an **unexpected** effect that cannot be foreseen from the teachings of any of Nakayama et al. or Miller, either taken alone or in combination. Miller neither deals with expandable microspheres nor gives the slightest hint that expandable microspheres can be treated without significant discoloration or adversely affecting the expansion capabilities. Thus, a person of ordinary skill in the art has no motivation to select any agent disclosed in Miller for use in the process of Nakayama et al. Therefore, claims 1-23 are clearly non-obvious over Nakayama et al. in combination with Miller.

Appellants further submit that Nakayama et al. disclose reducing the amount of residual monomer in a process of preparing an expandable microsphere by cyanoethylation. Nakayama et al. disclose various cyanoethylation agents, including sulfides, but **not** the distinct class of sulfur-containing agents as in the presently claimed invention. Furthermore, Nakayama et al. disclose that their most preferred cyanoethylation agents are primary lower amines or primary alkanolamines (*see Nakayama et al.*, Table 1 and col. 3, lines 40-42). All of the members of this class of cyanoethylation agents perform better than most other agents in reducing residual monomer from the expandable microsphere. The Examiner acknowledges that the sulfur-containing agents disclosed in Nakayama et al. do not perform

optimally as compared with other agents in Nakayama et al.'s process for preparing thermo-expandable microspheres.

Appellants submit that the cyanoethylation agents in Nakayama et al. reduce the amount of residual monomer in the expandable microsphere while maintaining other crucial properties of the thermoplastic microsphere, such as the **expandability** of the thermoplastic microsphere. In contrast, Miller discloses the use of **sulfites** in reducing residual acrylonitrile amounts in **aqueous dispersions**, which may comprise polymeric "latices" based on acrylonitrile. The Examiner does not dispute that the properties and characteristics of the aqueous dispersions disclosed in Miller are very different from the expandable microspheres taught in Nakayama et al. The expandable microspheres in Nakayama et al. **as well as** in the claimed invention have specific characteristics that are **not** present in the polymers described in Miller. Moreover, Table 1 of the present invention clearly illustrates that certain agents that react with the residual acrylonitrile and alkylacrylonitriles compromise the **color and expandability** of the resulting microsphere. Such agents that compromise important characteristics of the resulting microspheres include **sulfur-containing agents**, such as diphenyl sulfoxide. In addition, Nakayama et al. recognized that maintaining expandability is an important requirement for the chosen agents to reduce the amount of residual acrylonitrile and teaches or suggests that the sulfur-containing agents (sulfide and sulfates) are not performing optimally in the described process. The skilled artisan therefore would not have been motivated to replace the agents disclosed in Nakayama et al. **to reduce the amount of residual acrylonitrile in the polymeric shell of the expandable microspheres with the sulfur-containing agents (sulfites)** as in the claimed invention. Further, there is nothing in the teachings of Miller that suggests that the sulfur-containing agents (**sulfites**) that are disclosed therein are useful in the process of reducing the amount of residual acrylonitrile monomers in a polymeric shell of an expandable microsphere **while retaining its expandability and color**. These characteristics are irrelevant with respect to the polymers (latices) of Miller. Thus, Appellants submit that there is no motivation to combine the teachings of Miller with Nakayama et al., substituting the disclosed cyanoethylation agents in Nakayama et al. with a **sulfite** as disclosed in Miller to arrive at the claimed process.

The Examiner's arguments do not establish why it would be obvious to a person skilled in the art to select the sulfur-containing agents of the present invention in favor of all substances known to react with monomers in the absence of any clear **advantages**. Miller, in contrast to both Nakayama et al. and the claimed invention, fails to recognize the importance

of retaining specific properties of expandable microspheres. The fact that no prior art, whether in the cited references or common knowledge available to the skilled artisan, suggests that the sulfur-containing agents of the present invention could solve the problem of eliminating or reducing residual monomers from expandable thermoplastic microspheres without unacceptable discoloration is in itself convincing evidence of non-obviousness. Nakayama et al. do not disclose the sulfur-containing agents of the present invention, but instead regard sulfides as particularly preferred, in spite according to the Examiner, the well known problem of discoloration and bad smell, and thereby actually teaches away from the present invention and is a further strong indicator of non-obviousness. Appellants submit that the Examiner's reasons for obviousness are based on hindsight. Therefore, it is respectfully submitted that the teachings of Nakayama et al. in view of Miller would not teach or suggest to one of ordinary skill in the art to use **sulfites** in the process of reducing the amount of residual acrylonitrile monomers in a polymeric shell of an expandable thermoplastic microsphere **while retaining its expandability and color**. Thus, it is respectfully submitted that the pending claims are not rendered obvious by Nakayama et al. in view of Miller.

f. Claimed Invention Provides Unexpected Advantages of High Brightness and Expandability in Expandable Thermoplastic Microspheres

Appellants maintain that the expandable microspheres of the claimed invention **unexpectedly** provide advantageous properties of retaining excellent **expansion abilities and brightness** when compared to Nakayama's embodiments, which use sodium sulfide. In contrast, the Examiner argues that there is no evidence on record for unexpected expansion abilities and that the brightness results are not considered unexpected, arguing that the comparative reagent, sodium sulfide, is of a dark red/brown color that is expected to adversely affect the blueness characteristics of a polymer. However, Appellants contend that when the current invention uses sodium sulfide, as in Nakayama et al., to reduce the amount of residual monomer in the expandable microsphere, brightness is reduced. **Unexpectedly**, the use of other sulfur-containing agents (**sulfites**, and belonging to a different subclass of sulfur-containing agents) as in the claimed invention **both** significantly reduces the amount of residual monomer in the expandable microsphere while simultaneously retaining a high brightness (*see* Table 1 of the present specification). Thus, not only does Nakayama et al. in combination with Miller fail to teach or suggest the claimed invention, the claimed process provides **unexpectedly** better results of significantly reducing the amount of residual monomer, but also retaining color brightness of the expandable microsphere. Therefore,

Appellants submit that the claimed process of producing expandable thermoplastic microspheres or reducing the amount of residual monomers in an expandable thermoplastic microsphere is not taught or suggested by Nakayama et al. in view of Miller. Accordingly, Appellants submit that the claimed invention is non-obvious over the cited references.

g. Conclusion

Appellants respectfully submit that a *prima facie* case of obviousness cannot be made in view of the Nakayama et al. and Miller references, as cited in the Final Office Action. The cited references do not teach or suggest all of the limitations of the present claims. *See In re Royka, supra*. In particular, none of the references disclose or suggest to the skilled artisan reducing the amount of residual acrylonitrile monomers in the polymeric shell of an expandable microsphere using oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms, including sulfites as sulfur-containing agents, **while retaining its expandability and color**, as recited in claims 1-23.

Therefore, Appellants respectfully submit that the Final Office Action has not set forth a *prima facie* case for obviousness. Appellants respectfully submit that there is no motivation to combine the teachings of Miller with Nakayama et al., reducing the amount of residual acrylonitrile monomers in the polymeric shell of an expandable thermoplastic microsphere of the claimed invention using oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms, including sulfites as sulfur-containing agents, **while retaining its expandability and color**. Accordingly, the rejection of claims 1-23 under 35 U.S.C. § 103(a) over Nakayama et al. in view of Miller is improper and should be reversed.

8. CLAIMS APPENDIX

A “Claims Appendix” is attached hereto, and appears on the four (4) pages numbered “Claims Appendix 1-4.”

9. EVIDENCE APPENDIX

No evidence has been submitted pursuant to 37 C.F.R. §§ 1.130, 1.131 or 1.132. No other evidence has been entered by the Examiner or relied upon by Appellants in the appeal. An “Evidence Appendix” is nevertheless attached hereto and appears on the one (1) page numbered “Evidence Appendix 1.”

10. RELATED PROCEEDINGS APPENDIX

As indicated above in Section 2, there are no other prior or pending appeals, interferences, or judicial proceedings known by the undersigned, or believed by the undersigned to be known to Appellants or the Assignee, AKZO NOBEL N.V., “which may be related to, directly affect or be directly affected by or have a bearing on the Board’s decision in the pending appeal.” As such, there are no “decisions rendered by a court or the Board in any proceeding identified pursuant to [37 C.F.R. § 41.37(c)(1)(ii)]” to be submitted. A “Related Proceedings Appendix” is nevertheless attached hereto and appears on the one (1) page numbered “Related Proceedings Appendix 1.”

11. CONCLUSION

For the reasons indicated above, Appellants respectfully submit that the art of record does not disclose or suggest the subject matter as recited in the claims of the above-identified application. Accordingly, it is respectfully submitted that the subject matter as set forth in the claims of the present application is patentable.

In view of all of the foregoing, reversal of all of the rejections set forth in the Final Office Action is therefore respectfully requested.

Respectfully submitted,

Date: January 26, 2009

By: /Willem F.C. de Weerd/
Willem F.C. de Weerd
(Reg. No.51,613)

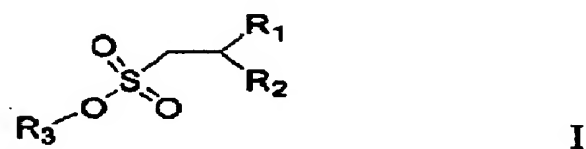
Kenyon & Kenyon LLP
Attorney for Appellants
(212) 908-6090

CLAIMS APPENDIX

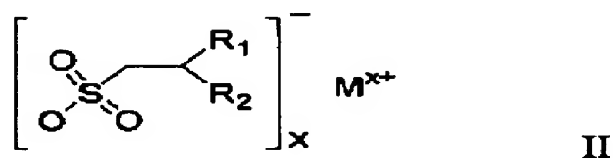
1. A process for the production of expandable thermoplastic microspheres comprising a step of contacting microspheres comprising a thermoplastic polymer shell encapsulating a propellant, said polymer shell being obtained by polymerising ethylenically unsaturated monomers, and further comprising residual monomers, with an agent reacting directly or indirectly with at least part of said residual monomers, wherein said agent is selected from the group consisting of oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms.
2. A process for eliminating or reducing residual monomers from thermoplastic expandable microspheres comprising a thermoplastic polymer shell encapsulating a propellant, said polymer shell being obtained by polymerising ethylenically unsaturated monomers, and further comprising residual monomers, the process comprising a step of contacting said microspheres with an agent selected from the group consisting of oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms.
3. A process as claimed in claim 1, wherein said agent is selected from the group consisting of bisulfites, sulfites and sulfurous acid.
4. A process as claimed in claim 2, wherein said agent is selected from the group consisting of bisulfites and sulfites.
5. A process as claimed in claim 1, wherein said agent is formed in situ from a precursor.
6. A process as claimed in claim 5, wherein said precursor is selected from the group consisting of disulfites, ditionites and sulfur dioxide.
7. A process as claimed in claim 1, wherein the expandable microspheres during the step of contacting them with the agent for reacting with residual monomers are in the form of an aqueous slurry or dispersion originating from a polymerisation mixture in which the microspheres have been produced.
8. A process as claimed in claim 1, wherein the residual monomers comprise at least one of acrylonitrile and methacrylonitrile.

9. A process as claimed in claim 1, wherein the thermoplastic polymer shell of the expandable microspheres is made from a homo- or co-polymer obtained by polymerising ethylenically unsaturated monomers, of which the total amount of nitrile containing monomers is at least about 70 wt%.
10. A process as claimed in claim 2, wherein said agent is selected from the group consisting of bisulfites, sulfites and sulfurous acid.
11. A process as claimed in claim 10, wherein said agent is selected from the group consisting of bisulfites and sulfites.
12. A process as claimed in claim 2, wherein said agent is formed in situ from a precursor.
13. A process as claimed in claim 12, wherein said precursor is selected from the group consisting of disulfites, ditionites and sulfur dioxide.
14. A process as claimed in claim 2, wherein the expandable microspheres during the step of contacting them with the agent for reacting with residual monomers are in the form of an aqueous slurry or dispersion originating from a polymerisation mixture in which the microspheres have been produced.
15. A process as claimed in claim 2, wherein the residual monomers comprise at least one of acrylonitrile and methacrylonitrile.
16. A process as claimed in claim 2, wherein the thermoplastic polymer shell of the expandable microspheres is made from a homo- or co-polymer obtained by polymerising ethylenically unsaturated monomers, of which the total amount of nitrile containing monomers is at least about 70 wt%.
17. Expandable thermoplastic microspheres comprising a thermoplastic polymer shell encapsulating a propellant, said polymer shell being obtained by polymerising ethylenically unsaturated monomers, and further comprising at least one non-polymeric reaction product of at least one monomer used for the polymer shell and an agent selected from the group consisting of oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms.

18. Expandable thermoplastic microspheres comprising a thermoplastic polymer shell encapsulating a propellant, said polymer shell being obtained by polymerising ethylenically unsaturated monomers, and further comprising at least one compound selected from the group consisting of salts and derivatives of sulfonic acid anion as defined in any one of Formula I:



where R₁ is a nitrile, carboxy ester, carboxy amide, carboxy acid or aryl group, and R₂ and R₃, independently of each other, are hydrogen or an alkyl group; or Formula II:



where R₁ is a nitrile, carboxy ester, carboxy amide, carboxy acid or aryl group, R₂ is a hydrogen or alkyl group, and M^{x+} is a cation having a valency of x.

19. Expandable thermoplastic microspheres as claimed in claim 18, wherein said salt or derivative of sulfonic acid anion is selected from the group consisting of 2-cyanoethanesulfonic acid, 2-cyano-2-methyl-ethanesulfonic acid, 2-aryl-ethanesulfonic acid, 2-methoxycarbonyl-ethanesulfonic acid, 2-methoxycarbonyl-2-methyl-ethanesulfonic acid, 2-carboxy-ethanesulfonic acid, 2-carbamoyl-ethanesulfonic acid, 2-cyano-ethanesulfonic acid methyl ester, 2-cyano-2-methyl-ethanesulfonic acid methyl ester, 2-methoxycarbonyl-ethanesulfonic acid methyl ester, 2-methoxycarbonyl-2-methyl-ethanesulfonic acid methyl ester, 2-carboxyethanesulfonic acid methyl ester, sodium, potassium, magnesium and ammonium salts of any one of 2-cyano-ethanesulfonate, 2-cyano-2-methyl-ethanesulfonate, 2-arylethanesulfonate, 2-methoxycarbonyl-ethanesulfonate, 2-methoxycarbonyl-methylethanesulfonate, 2-carboxy-ethanesulfonate, and 2-carbamoyl-ethanesulfonate.

20. Expandable thermoplastic microspheres comprising a) a thermoplastic polymer shell encapsulating a propellant; and b) at least one nonpolymeric reaction product of at least one monomer used for the polymer shell and an agent selected from the group consisting of oxo acids of sulfur, salts and derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms; said polymer shell being made of a homo- or copolymer from ethylenically unsaturated monomers and total amount of nitrile containing monomers in the polymer shell is at least about 70 % wt, said microspheres comprising less than about 100 ppm residual nitrile containing monomers and having a brightness according to ISO 2470 of at least about 75%.

21. A process as claimed in claim 1, wherein said agent is formed in situ from a precursor selected from the group consisting of disulfites, ditionites and sulfux dioxide, wherein the expandable microspheres during the step of contacting them with the agent for reacting with residual monomers are in the form of an aqueous slurry or dispersion originating from a polymerisation mixture in which the microspheres have been produced, and wherein the thermoplastic polymer shell of the expandable microspheres is made from a homo- or copolymer obtained by polymerising ethylenically unsaturated monomers, of which the total amount of nitrile containing monomers is at least about 70 wt%.

22. A process as claimed in claim 1, wherein the expandable microspheres retain a brightness according to ISO 2470 of about 70% or more.

23. A process as claimed in claim 2, wherein the expandable microspheres retain a brightness according to ISO 2470 of about 70% or more.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE